This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

HARVARD UNIVERSITY.

LIBRARY

OF THE

MUSEUM OF COMPARATIVE ZOÖLOGY.

20921

GIFT OF

Samuel Henshaw

June 4, 1903.

Digitized by Google

DEPARTMENT OF AGRICULTURE,
SYDNEY, NEW SOUTH WALES.

Miscellaneous Publication, No. 454.

TWO NEW WHEAT PESTS:

BY

WALTER W. FROGGATT,
GOVERNMENT ENTOMOLOGIST.

SYDNEY: WILLIAM APPLEGATE GULLICK, GOVERNMENT PRINTER

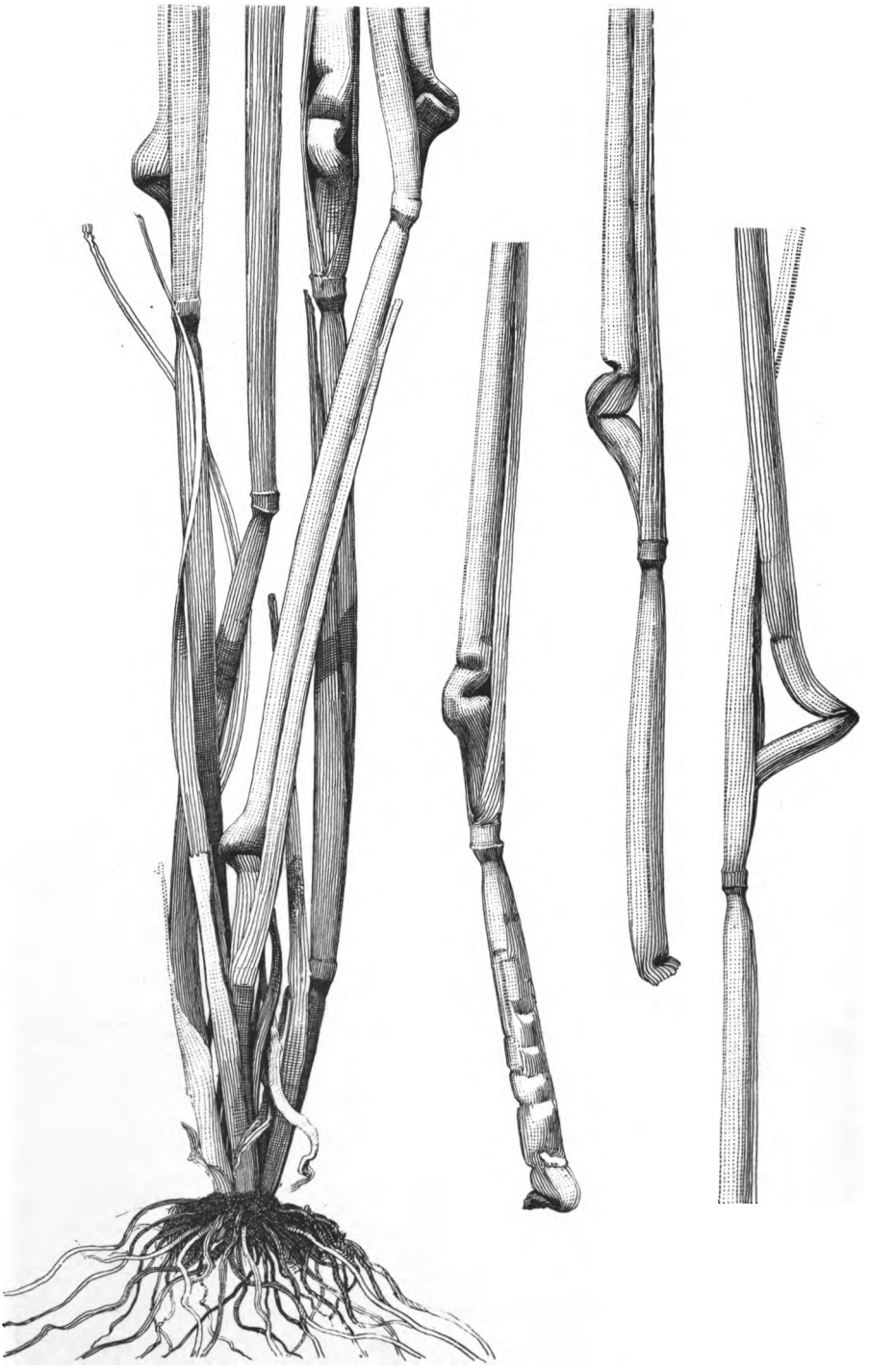
76445

1901.

Digitized by Google

Digitized by Google

Digitized by Google



WHEAT-STEMS WHICH HAVE BEEN DAMAGED BY APHIDES.

Digitized by Google

FROM AGRICULTURAL GAZETTE OF N. S. WALES.

March, 1901.

Two New Wheat Pests.

BY WALTER W. FROGGATT,
Government Entomologist.

1. APHIS DESTROYING WHEAT.

THE action of different groups of suctorial insects upon the growth and malformation of plant tissue is well known to both entomologists and botanists, and the same cause that produces the typical vegetable gall is also present in the minor injuries produced by the punctures of coccids and aphis upon plants. As an example, we have a native coccid (*Eriococcus turgipes*, Mask) which infests the foliage of the young "she-oaks" (*Casuarina*) here; the rounded white egg-like sac of the insect is attached to the slender branchlet, which it frequently causes to curl right round in a half-knot, so that when a bush is badly infested with these scales it has a most distorted appearance. In the same manner, when a young peach-tree badly infested with peach aphis (*Aphis Persica-niger*, Sm.) is neglected, the tender young branchlets bend round at the tips as if they had been weakened on one side. These and various other instances are not uncommon, but I here record the first instance that I can find of wheat being aborted in this manner. Early last month some specimens of wheat-stalks were received at the Hawkesbury Agricultural College from W. G. Lamb, manager of Carryo Station, near Carrathool, which were twisted and bent in such a manner that they suspected that it was infested with Hessian fly. The specimens were referred to me, and after receiving a fresh supply of specimens, in which I found the remains of several aphides under the flag of the wheat, I was still doubtful whether the primary cause of the damage was aphis. I therefore gladly accepted Mr. Lamb's invitation to visit the wheat-fields and settle the matter. The paddocks infested consisted of some of the finest wheat I have seen growing in the Riverina, with full plump ears. This wheat was growing upon rather light red soil, and was very forward. In walking through the field we found in all the more luxuriant patches perhaps 10 per cent. of the stalks snapped off an inch or two above the ground, just as they were beginning to fill out in the head. Careful examination showed that the stools had been infested with aphis at an early stage of growth, probably when the wheat was about 6 inches in height, and by sucking out the sap from the side, probably on account of the protection the flag gave them, the aphis had caused the stalk to bend down, twist, or sometimes almost form a knot which it afterwards recovered from, and shot up again, as well as the uninjured stems, but when the ripening of the wheat commenced, the weight of the head and the dying of the stalk caused it to break off

Digitized by Google

when the first strong wind came along. Further examination showed that beneath the wheat were quantities of the remains of aphis, and also hundreds of the pupæ of our large common Syrpus fly (*Psilopus Sydneyensis*, Macq.) which in the larval stage feeds upon all kinds of aphis, and it was the multitude of these fly larvæ that had saved the wheat from more serious damage from the aphis.

Shortly after this station was visited a report of a similar "disease" was forwarded by Mr. J. V. Ingram, "Norwood," Deniliquin, who wrote "I forward with this samples of the stalks of wheat that have grown in a way I have never noticed before. You will notice that the stalks have doubled up either from weakness or disease, I cannot say; at a certain stage they break off. I have some acres with about 20 or 30 per cent. broken off through this. The land is a sandhill, and the plants are not crowded, and the wheat looks healthy. There are two or three varieties affected. I have sent you a root, as all the plants seem to be only partially affected."*

During the month of June we had two reports of aphis having attacked lucerne—one from Mr. J. J. Tuilter, Gobarralong, Coolac, and the second from Mr. H. W. O'Donohoe, of "Tapio," Wentworth—so I should think that it was about this date the wheat was infested. Though I have been unable to find any record of aphis damaging wheat in this manner, one or more species are well known as wheat pests in Europe. The common wheat aphis (*Siphonophora granaria*, Kirby) has been known under a number of different names.† Buckton says that Fabricius called one, probably this species, *Aphis avenae*, but he gave no description of the insect, *Aphis hordii*, of Kyber, and Kaltenbach's *Aphis cerealis*, are synonyms of this insect. Buckton says:—"Early in the year the young aphides absorb sap from the blade, close to the stem, but later they attack the ears in vast numbers, inserting their rostra close to the juncture of the grains with the stalk. Sometimes there are as many aphides present as there are grains in the ears." He goes on to say that the crops sometimes become a sickly-yellow colour, but this is only temporary, as the parasitic *coccinellidæ* (beetles), and *ichneuminidæ* (wasps), soon clear them off the infested plants, in an ordinary season.

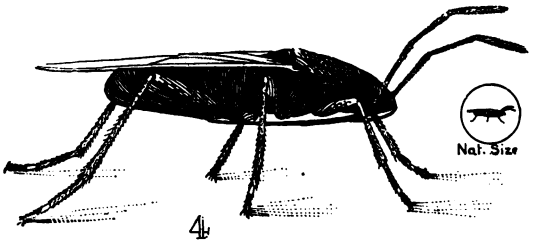
Another species, *Siphonophora pisi*, Kalt., the pea aphis, or, as it known among farmers, "Green Dolphin," is very common upon field peas; while another well-known species is the "Hip louse," *Phorodon humuli*, causes an immense amount of damage to the hop-fields of England, and a sudden invasion of the hop louse has caused an immense amount of damage to the hop growers; but, fortunately, they have some very serviceable allies in the coccinellid beetles, that also sometimes appear in immense numbers.

* The experimental wheat plots at the Wagga Experiment Farm were also damaged in a similar manner, and in some plots the majority of the stems were snapped off and lying on the ground. At the request of the Experimentalist, I inspected these plots early in December, and found that aphis was again the cause of the damage.

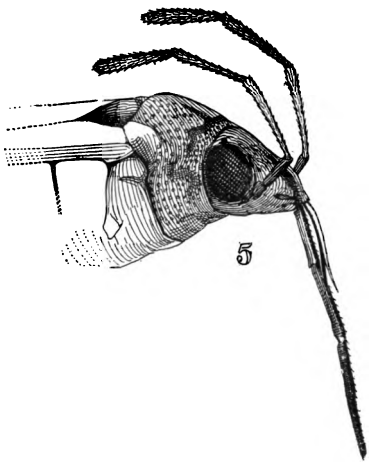
† Monograph of the British Aphides.—Buckton, vol. i, p. 116. London, 1876.

Digitized by Google

Digitized by Google

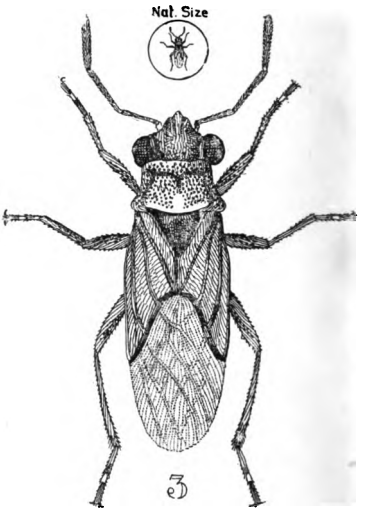


4

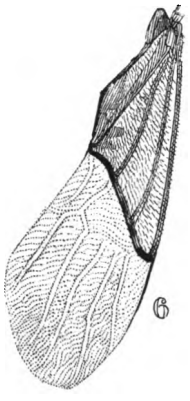


5

1



3



6

2

7

THE RUTHERGLEN BUG AS A WHEAT PEST.

A normal ear of wheat from infested paddock. 2. Ears showing effects of attack by Rutherglen Bug. 3 and 4. Rutherglen Bug, from above and side view. 5. Head of Rutherglen Bug (much enlarged) showing beak-like mouth extended. 6, 7. Wings in detail.

Digitized by Google

(2.) The Rutherglen Bug (*Nysius vinitor*, Bergr.).

In writing upon the Chinch Bug (*Blissus leucopterus*, Say.) a closely allied species to our Rutherglen Bug with almost identical habits, Professor Webster says, "No other insect, native to the Western Hemisphere, has spread its devastating hordes over a wider area of country with more fatal effects on the staple grains of North America, than has this one." Yet this insect is greatly checked in its native land by the heavy rains and inclement weather of winter, while in this genial climate, our pest has much greater advantages, and better chances of coming forth in the early spring. In America the Chinch Bug confines its attention to grain crops and native grasses, while our bug has not only developed a rapidly-growing appetite for all kinds of fruit and vegetables, but is now recorded as a wheat pest.

This bug took its popular name from the fact that it was first noticed, as a pest, in the vineyards around Rutherglen in Victoria, where it did a great amount of damage to the ripening grapes. We are indebted to Mr. French for the first description of this insect in his "Handbook of Destructive Insects of Victoria" (pt. I, p. 105), where it is called the "Rutherglen Fly Pest," and is figured as a cherry pest. In 1889–90 it swarmed all over the north-eastern districts of Victoria, and did an immense amount of damage to the grape crop. Mr. French has recorded it from nearly every district of Victoria, and notes its occurrence in South Australia; Lea has stated that it is common in the settled districts of Western Australia, but there is no mention of it, in Tryon's Report on "Insect and Fungus Pests, 1889," as occurring in Queensland, though it is probably found in the southern districts. In this Colony it has a wide range over the seaboard, stretching well out to the western country, while in the west there is another undetermined species, called by some of my correspondents, near Narrabri, the Coon Bug. It is about the same size but almost black when fully developed, with white markings on the wing covers; in its immature stages the body is bright red, and reports have been sent into the office of miles of fencing posts, crossing the plains, being so thickly coated with these baby bugs, which had swarmed up them when travelling, that they had a blood red appearance even at a considerable distance, and the others on the ground had destroyed all the herbage and grass in their march.

Among tomato, potato, and such succulent plants, they swarm up the main stalks and suck up the sap beneath the terminal crown of leaves, so that they droop and wilt if the infestation is slight, but if the bugs are numerous each leaf suffers and the plant dies back. Seed onions are another of their favourite plants, and at Maitland and Exeter many pounds of onion seed were destroyed by them before it ripened; the bugs both immature and adult swarming in the admirable cover that the seed-head provided, sucking all the nutriment out of the soft unripened seeds under shelter.

In the case of fruit it attacks a great number of different kinds, and we have numerous records of its depredations among peaches and

Digitized by Google

apricots, even while they are quite green and hard; when attacked at this stage of growth, the peaches often continue to grow, though deeply pitted with rounded punctures, which increase with the development of the fruit. Later on when they attack the ripe fruit, if they do not cause them to fall off, they cover the infested fruit with their droppings and render it unfit for sale. The Orchardist at Wagga Experiment Farm (Mr. Hogg) informs me that though the trees are only lightly infested with the bugs, if the fruit has been punctured it is of no use for preserving or bottling, as it will not keep however much it is boiled. This is very remarkable, as the amount of extraneous matter left in the peaches must be very slight, yet it probably affects the natural tissue of the fruit. The ripe cherries also have a great attraction for them, and this season I visited an orchard near Armidale where about a dozen large cherry-trees laden with fruit (in the corner of the orchard adjoining a crop of green oats from which the bugs had probably emigrated) were so thickly infested with these creatures, that the fruit was quite hidden by their presence, shrivelled, and turned to a dull grey tint with their excrement. On looking up into the branches one could see the fruit appearing brighter and cleaner towards the topmost branches, as the bugs always work upward from the ground.

Though among other plants the Rutherglen Bug has often been noticed in wheat-fields, and has been recorded doing considerable damage to young maize, yet it was not until the last month that I received specimens of damaged wheat-ears, in which the young wheat grain had been destroyed. Mr. John Bliss, of Armidale, when forwarding the wheat-ears, wrote, "It has attacked the wheat crops in patches, throughout the whole area, and wherever these patches occur the wheat (in the ear) is completely destroyed." An examination of the ears sent fully bore out these statements, as the small ears contained no wheat, while the other heads sent were full of plump grain.

The life history of this pest is not very well worked out, and I have never been able to find their eggs, though they must be deposited in immense numbers; as they are generally found most destructive near hedges and neglected waste land overgrown with weeds and grass, they probably deposit them in such localities, and like the chinch bug close to the base of the plants where the eggs are to a certain degree protected from the weather. The young bugs emerge as soon as the warm weather sets in, and generally begin to show up in October, though it is not till some time later that they commence to damage the plants or fruit in their neighbourhood. This is one of the insects that undergoes what naturalists call an incomplete metamorphosis—that is, it has not three complete changes of life like a moth, but as soon as it is hatched from the egg is a little bug, if wingless, and as it grows, moults its skin at regular intervals, becoming a little more developed at each moult, until at the last change of skin it emerges with perfect wings and the whole structure completed. In the earlier infestation one finds both adult bugs and smaller ones in all stages of growth, but later on in the season nearly all are winged and fully developed. There may be several broods of them, but I do not think

Digitized by Google

more than two in an ordinary season, though there are probably some that winter with us, for bugs are much hardier, able to resist climatic changes, and longer lived than many other insects, and a few Rutherglen Bugs are to be found among the weeds all through the year.

The Rutherglen Bug is an active little creature of a light brown colour, with silvery tinted wings, measuring about $\frac{1}{8}$th of an inch in length. It has perfectly developed wings and can fly well, yet its usual method of travelling is by crawling, and like all plant bugs its flight is short, for even when disturbed it generally flies or falls down beneath the tree. In spite of this on a warm summer day they take some catching, and if they have room to get away, many will escape from a spray by flight, and others by hiding on the undersurface of the foliage. The peculiar form of the fore wings which fold over, each forming a protective shield on the insect's back, will throw off the first mist of spray if it only falls on them from above. Now the above is the insect as the orchardist sees it, and calls "the fly," but there are a number of details to be noticed with a low-power lens, that when pointed out, separate it from a number of other little and often harmless species for which it might be mistaken by the ordinary examiner, which I here propose to point out as a popular scientific description.

The upper surface is dull brown, mottled with ochreous yellow, forming several fine parallel lines on the head, antennæ and legs dull yellow. The surface of the head and thorax covered with fine rounded impressed dark spots, and lightly clothed with fine yellow hairs that extend over the fore portion of wings. The head is pointed in front with the beak-like mouth hidden beneath, and when at rest folded under the thorax between the legs ; basal joint of antennæ stout, the three apical ones forming an elbow on the basal one, with the last one slightly thickened and fringed with fine short hairs ; eyes brown, very large, rounded, and standing out on the sides of the head. The thorax is truncate in front, with the prothorax wider at the base than at junction of head. The wings are folded over the back and abdomen like a flattened shield, semi-opaque, varying from light gray to light brown, in different lights, mottled with dark brown upon the nervures. The legs long, slender, brown, marked with black on the thighs, tip of tibia, and tarsi.

Remedies.

In dealing with this pest we have to contend with a number of difficulties, and bear in mind that it is no use poisoning their food plant, because they stick their sharp little beaks through the surface and suck up the sap from beneath. In spraying with a contact poison such as tobacco wash or kerosene emulsion, though it will kill a large number there will be many that fly off and escape and so spread the pest further afield, which is not advisable.

This pest has to be treated by different methods according to the kind of crop or plants it is infesting, and though I am afraid that if it takes to wheat in a large way it may be very difficult to cope with ; other crops may be saved with a little trouble on the part of the

Digitized by Google

farmer or orchardist. When working among the caterpillars at Windsor, described in last month's *Gazette*, the Rutherglen Bug was also found plentiful in patches and fell readily into the hopperdozer used to catch the moth caterpillars. As onions, potatoes, tomatoes, and other field crops are always planted in rows, a similar arrangement could easily be dragged up and down the rows with beaters, and the bugs caught in such numbers that the odd ones remaining would not do much damage.

Catching with dish.—Last month I carried out some experiments in an orchard near Armidale with such a dish with very gratifying result. The dish was 3 feet long, 2 feet 6 inches wide, with the bottom flat, and the sides sloping up from a depth of 10 inches, shaped like a large meat dish (but found that the same width but 2 feet longer would be a much more serviceable size under fruit-trees, and not so wide across in field crops). The dish was made of galvanised iron, riveted at the corners, with a handle to drag it along, and cost 15s. Into the bottom was poured about 2 quarts of water and a pint of kerosene, filling to a depth of 3 or 4 inches, the dish was then pulled under the tree and the branches immediately above drawn down with one hand and given a gentle sharp shake, and tapped with a piece of board held in the other hand, when the bugs fell down in millions, and not one that touched the floating oil moved again; as soon as the oil splashed up the sides all that fell remained there. The dish was then pulled under another section and treated in the same manner, and with very little practice a tree was very quickly treated and no oil spilt.

I tried the dish first in the middle of the day, but the bugs were too active, and fully half of them escaped; at evening I again tried, but until dusk, after the hot summer's day, many of them were still pretty active, and the darkness spoilt the work. At daylight I again started and found the dish work splendidly, nearly every bug fell straight down into the dish, until they were piled up in countless millions and became a solid mass, and the fluid had to be renewed. There were many large black bulldog ants up the trees that had been out for the night among the cherries, but the oil was too much for them, for once they fell in they never managed to struggle out. As these bugs generally invade an orchard from some outside field or pasture, and attack the first trees they come across, when taken in time this method keeps them confined to one point, and I strongly recommend it to small orchardists or among irregularly grown peach, cherry, and other fruit-trees.

Fumigation with tent.—This well-known method of covering the tree with a tent and filling it with hydrocyanic acid gas was tried upon a number of smaller trees, as the tent used was too small for the larger ones. The tent was carefully lifted over the trees and the ordinary charge of 1 oz. cyanide of potassium, 3 oz. of sulphuric acid, and 9 oz. water to each 150 cubic feet of enclosed space, generated under the tree, and in less than fifteen minutes the dead bugs were piled up in heaps in the inner folds of the tent, and could be taken up in handfuls; and I believe even a smaller charge would be effective. In an

Digitized by Google

orchard like this it would be advisable to leave the damaged fruit upon the trees as a decoy to the travelling bugs, so that as they swarmed in the trees could be treated at intervals until the army was destroyed. One tree treated at midday with gas was found next morning to be nearly as thickly infested as before, but they had not spread on to the trees beyond. Where a tent is obtainable and the trees are of a uniform size there is no doubt that it is the most expeditious way of checking the damage, and the both combined will work wonders.

Several writers suggest burn all rubbish, weeds, &c., to destroy eggs, larvæ, &c., but we find them plentiful in the cleanest and best kept orchards, and as they as often as not breed in adjoining grass paddocks, hedges, and forest land, quite outside the jurisdiction of the person attacked, burning is not much use.

[Two plates.]

Sydney: William Applegate Gullick, Government Printer.—1901.

Digitized by Google

Digitized by Google

Digitized by Google

Digitized by Google

3 2044 107 282 600

Digitized by Google

Digitized by Google